How will Greenhouse Gas Policy Affect the Competitiveness of Canadian Agriculture

A Policy Issue Paper Prepared for the
Agriculture and Agrifood Climate Change Table

By

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Background

To adapt to climate change, Canadian agriculture must understand how its competitiveness is impacted. Determining the international competitiveness of Canadian agriculture is difficult as there are many variables affecting agriculture's competitiveness in the global market. Competitiveness can be assessed at many levels; international, national, industrial, and even individual company. This paper will address the competitiveness of Canada's agriculture on an international basis while considering national impacts. Agriculture's competitiveness in relation to climate change is based mainly on the size of the sector, the level of trade, level of emissions from the production of the traded products, and the direct and indirect climate impacts on agriculture.

A recent study conducted by the Organisation for Economic Co-operation and Development (OECD) concluded that industries with lower dependence on high carbon intensive energy would be more competitive than those with higher dependencies of high carbon intensive energy (OECD, 1997). While this appears to have little to do with agriculture, many of its suppliers are dependent on carbon intensive energy, so assessing the competitiveness of agriculture will require an understanding of its supporting sectors as well.

International Impacts on Competitiveness

On a global basis, Agriculture and Agri-food Canada has set the target of 4% of the total share of all agriculture trade. In components of agricultural production where Canada has a comparative advantage this figure is considerably higher. For example, Canada has approximately a 19 percent market share in world exports of wheat (Canadian Wheat Board, 1998). On average, Canada is the 3rd largest exporter of wheat, behind the United States and the European Union. However, although Canada produces significantly more wheat than it has internal markets for, and therefore ranks much lower as a wheat producer.

Canada exports a significant portion of its agricultural production, and as a result is very dependent on foreign markets to support its agriculture. Canadian agricultural exports of bulk and intermediate goods were $22.3 billion in 1997 (Canadian Grain Council, 1998). Given the target established by Ministers of Agriculture and Agri-food to increase Canada's market share, then agriculture and other related sectors will have to concentrate on increasing the exports of more value-added products and less on bulk products. This requires the involvement of more than just the agriculture sector.

A study was commissioned by Environment Canada, Natural Resources Canada, Industry Canada, Department of Finance and Foreign Affairs and International Trade Canada to determine the competitiveness of Canadian export products. The Standard and Poor's DRI concluded reducing CO2 emissions will impose short to medium term transition

costs on the Canada's economy. The study divided Canada's export products into four categories; "Cash Cows", "Star products", "Challenges" and "Opportunities".

The Cash Cow designation is for slow growing markets tending to be mainly primary commodities. This grouping forms approximately one-third of Canada's exports. These markets would generate income, but would not ensure growth in the future. The Prairie Provinces tend to export most of the primary agricultural goods, while Ontario and Quebec focus on the manufactured goods.

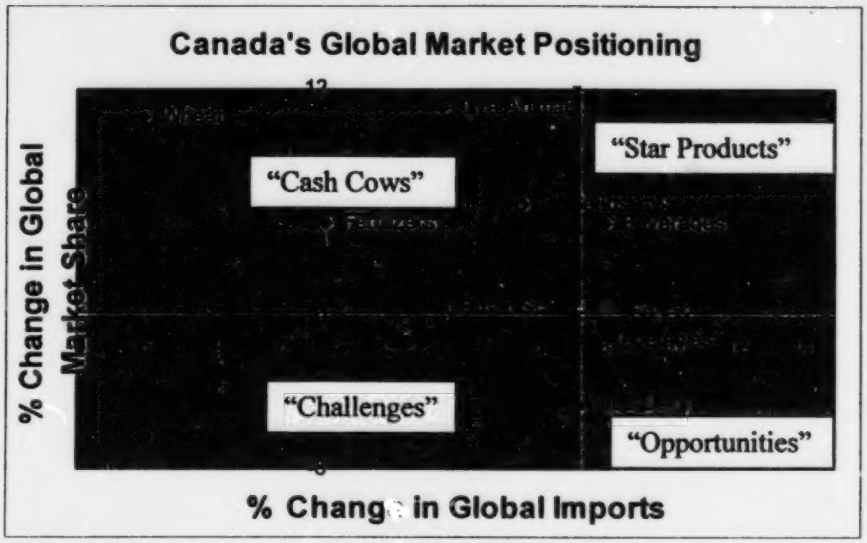
Star Products compete in markets that are fast growing and are increasing their market share. These tend to be products that have being through a value-added process. The products have the potential to be lucrative if Canada maintains its market share. Approximately 45% of Canada's exports are in these markets. The largest exports in these markets are motor vehicles and computers.

The "Challenges" are products that are competing in a slow or decreasing market, and are usually losing market share. Canada has approximate 14% of its exports in this category. Pulp, newsprint, meat and dairy products, and minerals are the main products that Canada exports in this category.

The "Opportunities" are products that are competing in an increasing market, but are losing market share. These products include such things as semi-conductors, engines, and appliances. Canada has approximately 8% of its exports in this category.

Figure 1 was adapted from the study to demonstrate where Canada's agricultural exports fall within the four categories. Most of the products fall into the Cash Cow category, which is where Canada has a stable or increasing share in markets that are growing slowly. This would include; wheat, live animals, fertilizers, oil seeds and other grains. Beverages are the only products that fall into the star product category, which represents an increasing market share in a growing market. Meat and dairy, as well as fruits and vegetables are less competitive in relatively slow growing markets.

Figure 1 Canada's Global Market Position



Source: Adapted from Standard and Poor's DRI, 1997

National Impacts on Competitiveness

Currently Canada is in the process of determining how it should best respond to climate change and the Kyoto Protocol. Although agriculture is responsible for approximately 10 percent of the greenhouse gas emissions, sectors that agriculture relies on, such as energy, transportation and other inputs are considered much larger emitters and could have significant impacts. Canada's agricultural production exceeds its consumption in many commodities. Agriculture is dependent on several sectors within Canada and externally to produce food and fibre. Emissions reductions and resulting impacts on agriculture will impact the following sectors significantly:

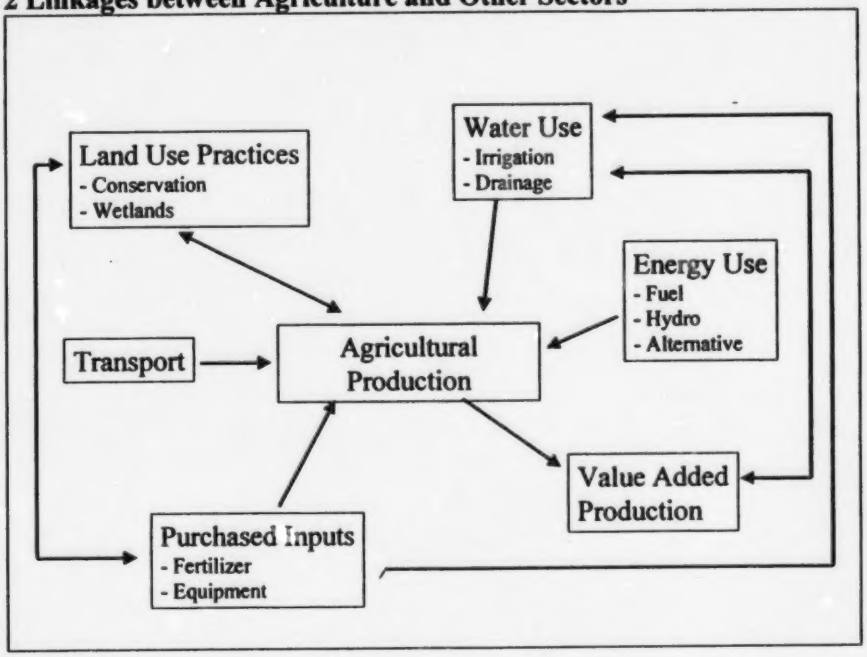
- Transportation of inputs to the farm and products to value-added facilities and export markets.
- Manufacturing of machinery and inputs such as fertilizer and pesticides.
- Energy such as electricity and fuel.

Canadian agriculture is dependent on a number of sectors for its production of food and fibre, as a result, can be impacted by changes not directed at agriculture. The energy, manufacturing, and the transportation industries all have major roles in agricultural production.

Policy changes that have a direct or indirect impact on agriculture, its suppliers or its users will have an effect on the competitiveness of Canadian agriculture. The inputs

from the energy and transportation sectors could have the most impact on agriculture, as these are the sectors where most of the reductions in emissions are expected.

Figure 2 Linkages between Agriculture and Other Sectors



Climate change will effect the availability of some farm inputs within Canada and abroad. For example, feed stocks such as corn, wheat, oats and barley might be produced closer or further away from the livestock that requires it.

Agricultural Impacts on Competitiveness

As indicated earlier, Federal and Provincial Ministers of agriculture and agrifood recently announced a target to increase the value of Canadian exports of agricultural products. In Manitoba for example, there is a push to double the production of hogs in the next five years. Federally and provincially there is a thrust to increase the value-added in most of Canada's agricultural products. This increases the pressure to increase production and processing, both of which contribute to greenhouse gas emissions. Livestock and certain cropping practices as well as some processing activities are seen as large emitters of greenhouse gases.

With the current technology, the increased processing and production is in direct competition with the objectives of greenhouse gas reductions of the Kyoto Protocol. To fulfill both the objective of increased processing and the objective of greenhouse reduction will require a change in production techniques that is less dependent on carbon intensive energy.

Climatic Impacts on Competitiveness

A number of climate change models suggest that Canada will improve its agriculture products competitiveness in the foreign markets, because climate change will have negative implications around the world and not as severe in Canada, in fact, in some cases, positive impacts. Table 1 summarizes a number of studies on the impacts of climate change conducted around the world. The regions in this table are very large, and as a result the ranges are quite varied within a region. While the ranges are large in many cases, an approximate for the effect on world production of crops is possible, particularly by region.

Table 1 World Agriculture Impacts of Climate Change

Region	Crop	Yield Impact (%)	Countries studied/comments
Latin America	Maize	-61 to increase	Argentina, Brazil, Chile, Mexico. Range across GCM scenarios, with/without the CO2 effect.
	Wheat	-50 to –5	Argentina, Uruguay, Brazil. Range across GCM scenarios, with/without the CO2 effect.
	Soybean	-10 to +40	Brazil. Range across GCM scenarios, with CO2 effect.
Former Soviet Union	Wheat Grain	-19 to +41 -14 to +13	Range across GCM scenarios and region, with CO2 effect.
Europe	Maize	-30 to increase	France, Spain, N Europe. With adaptation, CO2 effect. Longer growing season; irrigation efficiency loss; northward shift.
	Wheat Vegetables	increase or decrease increase	France, UK, N Europe. With adaptation, CO2 effect. Longer season: northward shift, greater pest damage; lower risk of crop failure.
North America	Maize Wheat	-55 to +62 -100 to +234	USA and Canada. Range across GCM scenarios and sites with/without CO2 effect.
	Soybean	-96 to +58	USA. Less severe or increase in yield when CO2 effect and adaptation considered.
Africa	Maize	-65 to +6	Egypt, Kenya, South Africa, Zimbabwe. With CO2 effect, range across sites and climate scenarios.
	Millet	-79 to –63	Senegal. Carrying capacity fell 11-38%.
	Biomass	decrease	South Africa; agrozone shifts.
South Asia	Rice Maize Wheat	-22 to +28 -65 to –10 -61 to +67	Bangladesh, India, Philippines, Thailand, Indonesia, Malaysia, Myanmar. Range over GCM scenarios, and sites: with CO2 effect; some studies also consider adaptation.
Mainland China and Taiwan	Rice	-78 to +28	Includes rainfed and irrigated rice. Positive effects in NE and NW China, negative in most of the country. Genetic variation provides scope for adaptation.
Asia (other) and Pacific Rim	Rice	-45 to +30	Japan and South Korea. Range is across GCM scenarios. Generally positive in northern Japan; negative in south.

	Pasture	-1 to +35	Australia and New Zealand. Regional variation.
	Wheat	-41 to +65	Australia and Japan. Wide variation, depending on cultivar.

Source: Reilly *et al.* (1996) cited in Bazzaz and Sombroek, 1996

The studies have focused on the major crops of the world, maize, wheat, rice and soybeans. Maize production for the most part is on the decrease, with some minor exception in North America. Wheat production around the world ranges from –61 % to +67%, excluding North America. In North America the range is significantly larger at –100% to +234%. Canadian wheat production is expected to be at the higher end of the range due to the increase in temperature is some regions as well as shifting precipitation patterns (Arthur, 1988).

Rice production appears to decrease on average. Rice production is considered one of the largest sources of methane gas (CH_4). Soybean production appears to decrease in some parts of North America, while Latin America appears to increase its production of soybeans.

What Do We Need to Know

As mentioned earlier, the competitiveness of Canada's agriculture is dependent on a variety of components ranging from international markets to agriculture's ability to adapt to the changing climate. The work outlined in this paper represents a cursory review of the required information to determine the level of competitiveness in agriculture. Much more detailed information is required for an accurate assessment.

The international markets will become more complicated to track accurately, as the supply and demand of agriculture products will change due to the impact on production in many regions of the world. A much better understanding of the global impacts of climate change is required. Each country would be responding to climate change in their own way, and to successfully adapt, Canada must track and respond accordingly to their actions.

At a National level, Canadian agriculture's competitiveness is dependent on how Canada responds to the physical climate change as well as the Kyoto Protocol. Adaptation will be necessary that incorporates the impacts on the transportation, energy, and fertilizer sectors, just to name a few. The government policies that are developed to address climate change will require a review of many of these impacts to ensure that barriers are removed that will harm the agriculture sector and that new barriers are not established.

Agriculture itself will have to develop a strategy for addressing climate change that eliminates the direct conflicts with reducing greenhouse gas emissions. Strategies that remove the dependence on carbon intensive energy, for example, has the potential for

reducing input costs of production and addressing the greenhouse gas emissions. This improves the competitiveness of agriculture in the national and international settings.

Farmers and processors will require information about the changing climate and the changing markets to remain competitive. As well both farmers and processors will need to have more knowledge about the availability of inputs and changing cost structures to develop their own business plans.

There are some estimates of how Canadian agriculture might change in terms of potential to grow new crop varieties and livestock potential. For example, warming in Atlantic Canada could improve the competitiveness of the agricultural industry by expansion of production in corn, soybeans, fruit trees and specialty crops. Warming in the Prairies could lead to an expansion of wheat and corn, as well as specialty crops. Warming with reduce the winter stress of livestock, but could increase the summer stress.

What are the Gaps

- Further information is required on world impacts of climate change and the resulting market changes.
- It is not clear how emitters of greenhouse gases in Canada will be expected to change their actions.
- Farmers and processors require more information about climate change and its impacts on them as well as the impacts felt in their export and import markets.